

Report Plexos Project

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Report delivered:

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Abstract

1 Introduction

2 Theory

2.1 Methods in present work

2.2 intermittent resource handling

2.3 reservoir hydro handling

2.4 region exchange

2.4.1 Advantages

2.4.2 Disadvantages

2.5 investment initiatives for renewable sources

- investment support

One time financial support to cover part of the investment costs. The support is large enough to make the investment profitable. Some differences can be used for fine tuning, e.g. more support for wind power in areas with less wind.

 - advantages
 - * possibility of finetuning
 - disadvantages
 - * requires much capital at beginning
 - * no incentive to reduce
 - * limited security for investor
 - * in case of fine tuning: much administration
- tendering

Auction for a certain amount of capacity which shall be installed. Won by the offers requiring the lowest support. This initiative is also done as investment support, but with a tendering procedure. Providers are asked for support bids, the cheapest one gets the support.

 - advantages
 - * competition between suppliers, therefore lower costs than investment support
 - disadvantages
 - * same as investment support, but
 - * less predictability
 - * prone to corruption
- feed-in tariff

A fixed price for feed-in kWh is paid for a predefined period.

 - advantages
 - * promotion of mid-term and long-term technologies
 - * investment security for producer
 - disadvantages
 - * possible risk of technology overfunding
- premium

Like feed-in tariff, but instead of a fixed price an additional amount per kWh is paid to the producer.

- advantages
 - * market based
- disadvantages
 - * less certainty than feed-in tariff
- green certificates

3 Analysis

3.1 MT Schedule

The medium term schedule is done for one year. Three different scenarios (low, normal, high inflow) to the reservoirs in Norway and Sweden are simulated. The different scenarios are described below.

3.1.1 normal inflow scenario

For this case a normal inflow scenario was chosen. The inflow accords to the average inflow in a year in Norway and Sweden.

optimal generation dispatch

The optimal generation dispatch for normal inflow for Germany can be seen in figure 1. The generation dispatch for swedish generation units can be seen in figure 2, the norwegian dispatch is shown in figure 3.

transmission

The transmission between the three countries Norway, Sweden and Germany is shown in figure ???. It is done not considering the flow direction, but the amount of power.

emission

The total emissions for all countries together can be seen in figure ??. The emissions can be interpreted in following way:

- Norway: Due to the fact that most power installed is done with renewables (hydro power, wind power) and only some small amount of gas power, there are hardly any CO_2 -emissions in Norway.
- Sweden: Some renewable energy and a large amount of nuclear power lead to small CO_2 -emissions.
- Germany: The biggest amount of the produced emissions are emitted from german power plants.

price

Energy prices for the different weeks of 2014 for the analyzed countries are shown in figure 5.

3.1.2 high inflow scenario

3.1.3 low inflow scenario

3.2 Expansion planning

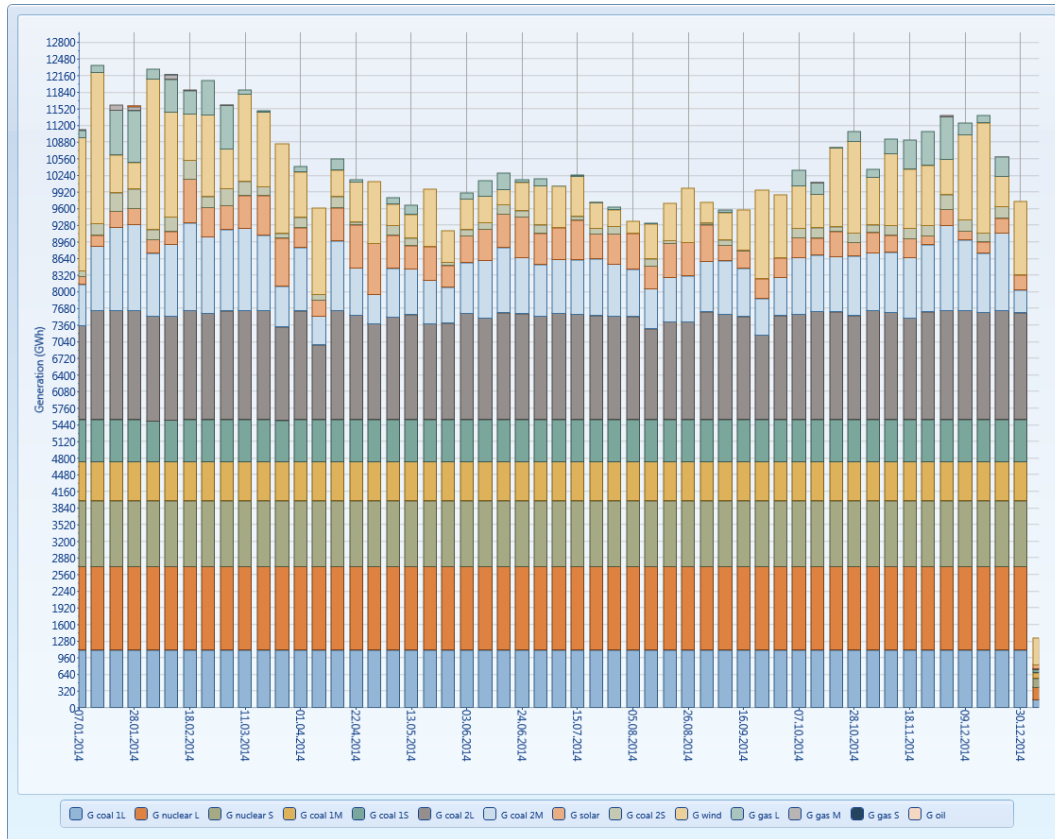


Figure 1: Optimal generation dispatch for Germany 2014 with normal inflow

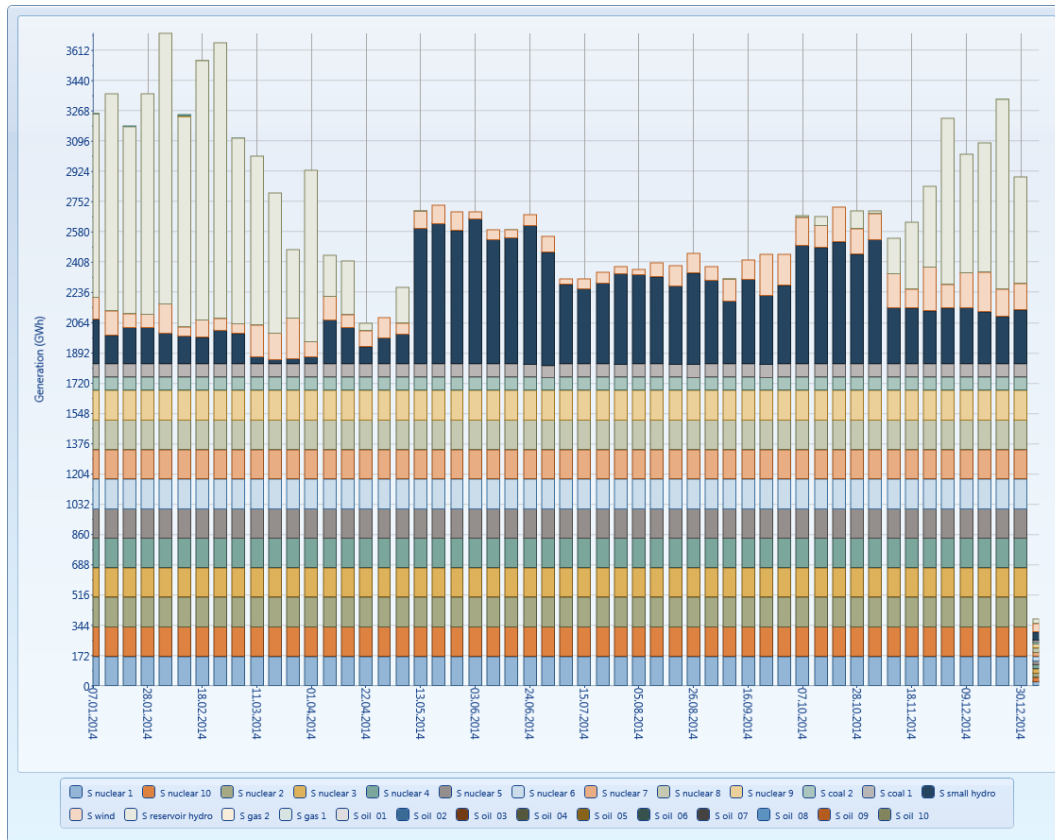


Figure 2: Optimal generation dispatch for Sweden 2014 with normal inflow

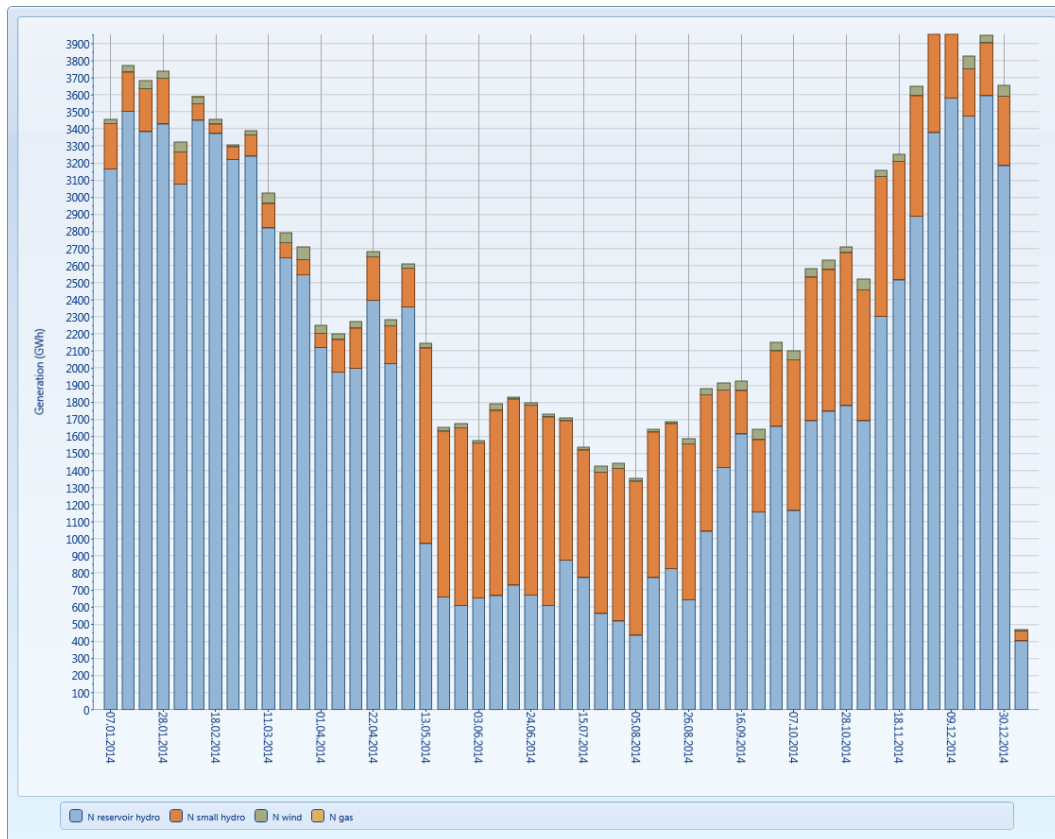


Figure 3: Optimal generation dispatch for Norway 2014 with normal inflow

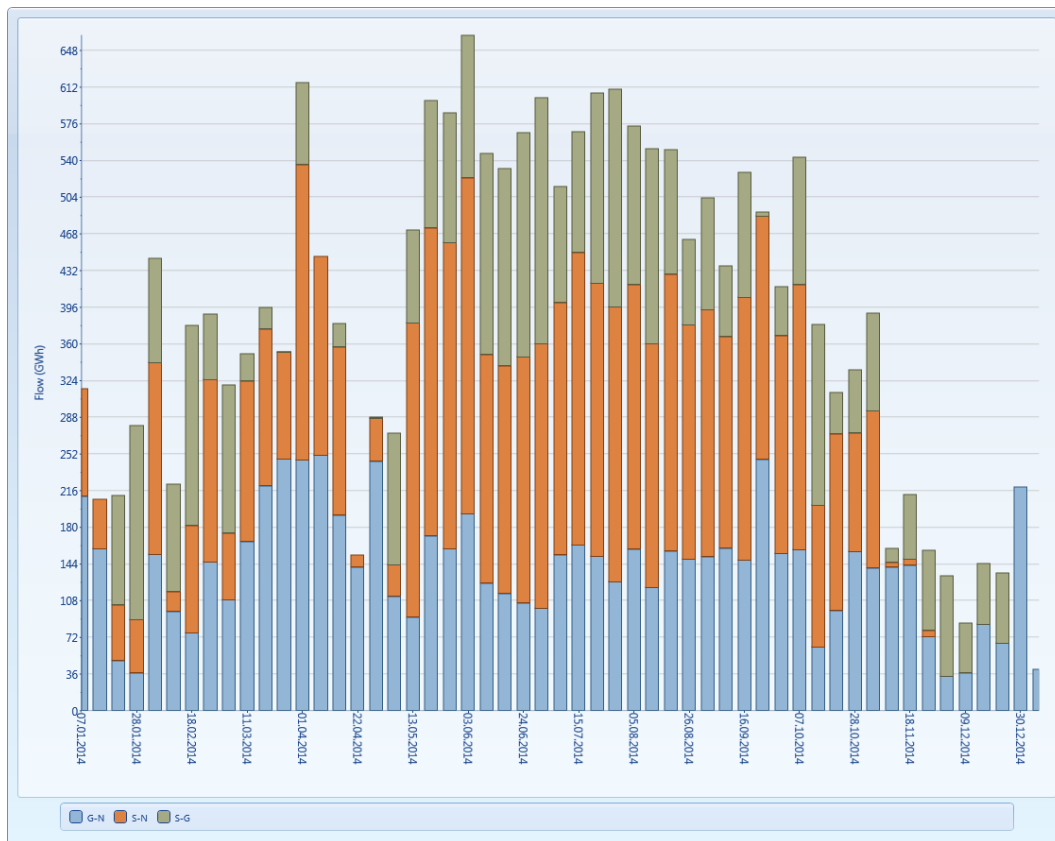


Figure 4: Transmission between N/W/S with normal inflow

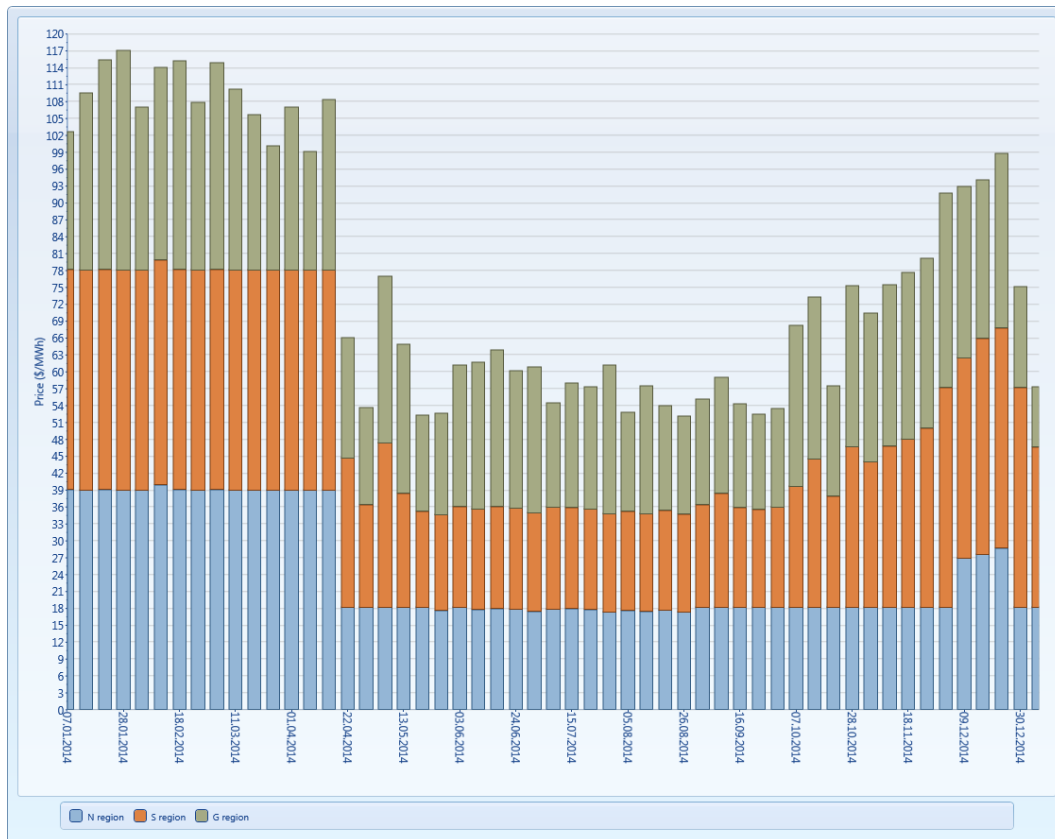


Figure 5: Calculated prices with normal inflow

4 Conclusion